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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/075,643	02/13/2002	Young-Beom Jang	8045-36	9381
	7590		(PX1344-US/SSD)	
Frank Chau, Esq. F. CHAU & ASSOCIATES, LLP 1900 Hempstead Turnpike East Meadow, NY 11554			EXAMINER DO, CHAT C	
			ART UNIT	PAPER NUMBER
			2124	

DATE MAILED: 01/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/075,643

Applicant(s)

JANG, YOUNG-BEOM

Examiner

Chat C. Do

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to because Figures 8-9 are not quite clear to view. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claims 1, 7, 10-11, 14, and 17-21 are objected to because of the following informalities:

In these independent claims, the applicant is advised to rewrite the term "CSD" as "canonical signed digit (CSD)" for clarification.

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Re claims 1 and 7, the applicant is advised to rewrite the phrase “(n: natural number more than 2”) in lines 2-3, line 31 and “(k: natural numbers more than 4)” in line 29 as “wherein n is natural number more than 2” and “wherein k is natural number more than 4” respectively in order for consideration.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Pasko et al.

(“Optimization Method for Broadband Modem FIR Filter Design using Common Sub-expression Elimination”).

Re claim 1, Pasko et al. disclose 2-3 a filter coefficient design method (abstract) in a digital filter (FIR filter in abstract lines 1-5 page 100) having a plurality of filter coefficients that are expressed with CSD code words of n bits (n: natural number more than 2) (e.g. page 100 right column lines 9-16), comprising the step of: making code word sub-expression for random filter coefficients out of the filter coefficients as a virtual common sub-expression that is relevant to a predetermined common sub-expression so that adders are shared with the common sub-expression in tap Lines of the random filter coefficients (e.g. Figure 2 and left column page 101 under method overview section).

Re claim 2, Pasko et al. further disclose 2-3 the virtual common sub-expression becomes identical to the common sub-expression through bit-shift (e.g. double arrow in Figure 3c).

Re claim 3, Pasko et al. further disclose 2-3 the virtual common sub-expression becomes identical to the common sub-expression through bit-add (e.g. addition box in Figure 3c).

Re claim 4, Pasko et al. further disclose 2-3 the virtual common sub-expression becomes identical to the common sub-expression through bit-inversion (e.g. minus sign in the last box of addition in Figure 3c).

Re claim 5, Pasko et al. further disclose 2-3 the virtual common sub-expression becomes identical to the common sub-expression through at least two more processes out of bit-shift, bit-add and bit-inversion (e.g. Figure 3 contains all the shift, add, subtract/inversion).

Re claim 6, Pasko et al. further disclose 2-3 the digital filter is a linear phase FIR filter (e.g. Figure 3a).

Re claim 7, Pasko et al. disclose in Figures 2-3 a method for receiving and filtering input signals of digital samples of k bits (k : natural numbers more than 4) in a digital filter having filter characteristics that are created by filter coefficients being expressed as CSD code words of n bits (n : natural numbers more than 2), comprising the steps: creating as a virtual common sub-expression (e.g. CSD coefficients set-optimized in Figure 2) common sub-expressions created by bit-shift, bit-add, or bit-inversion (e.g. these operations are seen in Figure 3c) of random coefficient sub-expressions (e.g. Figure

3a wherein h_0 - h_2 are coefficients of the FIR filter) out of the digital filter coefficients, thereafter shifting the digital samples by the number of bits corresponding to the common sub-expression and the virtual common sub-expression, adding (e.g. all the addition boxes in Figure 3c) up all the digital samples shifted by the number of bits corresponding to the common sub-expressions to obtain a composite output value of a common coefficient tap line; obtaining composite output values of random coefficient tap lines by adding up (e.g. y_0 - y_2) the digital samples shifted by the number of bits corresponding to the virtual common sub-expression and the composite output value of the common coefficient tap line being used as a common input; and performing in order delaying (e.g. Figure 3a wherein z^{-1} is the delay for proper FIR filter) and adding to create filter output values by subsequent compositions of the composite output values of the common coefficient tap lines and the composite output values of the random coefficient tap lines.

Re claim 8, Pasko et al. further disclose in Figures 2-3 the number of the tap lines is set as 73 in case where the digital filter is used in a middle frequency terminal of a mobile radio communication system (e.g. page 101 last line of left column and first line of the right column).

Re claim 9, Pasko et al. further disclose in Figures 2-3 the number of bits of the CDS code word is 24 bits (e.g. page 101 last line of left column and first line of the right column).

Re claim 10, Pasko et al. disclose in Figures 2-a digital filter, comprising: a shift register group (e.g. $\gg 3$ and $\gg 2$ in Figure 3c) including first shift register members each receiving digital samples of k bits as input signals and shifting the received digital

samples by bit shift values of filter coefficients that are defined as common sub-expressions out of filter coefficients that are expressed as code words of n bits within CSD code, and second shift register members shifting code words of the other filter coefficients that are not defined as the common sub-expressions by using the code words of the common sub-expressions, a adder group (e.g. all addition boxes in Figure 3c) including first composite members adding up the shifted digital samples that are output from the first shift register members to provide them to common tap Lines, and second composite members for adding the shifted digital samples that are output from the second shift register members to the composite outputs of the common tap Lines to provide the results to each of corresponding tap Lines; a delay group (e.g. all z^{-1} in Figure 3a) including a plurality of delayers connected to the tap Lines and being connected in series from one another to provide delay to the composite outputs; and an output adder (e.g. last adder in Figure 3a) group including a plurality of adders for adding up the outputs of the delayers and the composite outputs of the tap Lines to create digital output signals of k bit(s).

Re claim 11, it has same limitations cited in claim 10. Thus, claim 11 is also rejected under the same rationale as cited in the rejection of rejected claim 10.

Re claim 12, Pasko et al. further disclose in Figures 2-3 the common tap Line is a tap Line of filter coefficients having the greatest number of common coefficient sub-expressions out of the filter coefficients (e.g. page 102 right column lines 1-10).

Re claim 13, Pasko et al. further disclose in Figures 2-3 the digital filter is designed with software by a digital signal processor performing shifting, adding, and

delaying (e.g. page 100 left column first paragraph under the introduction section and all the section under page 102 right column including pattern identification, pattern selection, and searching algorithm).

Re claim 14, it is a method claim of claim 1. Thus, claim 14 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 15, Pasko et al. further disclose in Figures 2-3 at least the second sub-expression is formed from the virtual common sub-expression through at least one of a bit-shift, a bit-add and a bit-inversion (e.g. Figure 3b).

Re claim 16, it is a method claim of claim 5. Thus, claim 16 is also rejected under the same rationale as cited in the rejection of rejected claim 5.

Re claim 17, it is a program storage device claim of claim 1. Thus, claim 17 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 18, it is a system claim of claim 1. Thus, claim 18 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 19, Pasko et al. disclose in Figures 2-3 at least one shift register (e.g. $\gg 3$ and $\gg 2$ in Figure 3c) for receiving digital samples of input signals and shifting the received digital samples by bit-shift values of filter coefficients that are defined relative to a virtual common sub-expression; a first adder (e.g. first adder that add x and $-x \gg 3$ in Figure 3c) for adding shifted digital samples that are output from the at least one shift register to drive a common tap Line; a second adder (e.g. adder for yielding y_1 in Figure 3c) for adding shifted digital samples that are output from the at Least one shift register to the output of the common tap line to drive a tap line corresponding to a filter coefficient;

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and at Least one delay unit (e.g. z^{-1} in Figure 3a) connected to a tap Line for delaying an output signal component.

Re claim 20, it has same limitations cited claim 19. Thus, claim 20 is also rejected under the same rationale as cited in the rejection of rejected claim 19.

Re claim 21, it is a program storage device claim of claim 20. Thus, claim 21 is also rejected under the same rationale as cited in the rejection of rejected claim 20.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. NPL to Hyeong et al. disclose a FIR filter synthesis algorithms for minimizing the delay and the number of adders.
- b. NPL to Hyeong et al. disclose a multiplier-less IIR filter synthesis algorithms to trade-off the delay and the number of adders.
- c. NPL to Richard discloses a sub-expression sharing in filters using canonic signed digit multipliers.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The examiner can normally be reached on M => F from 7:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaki Kakali can be reached on (571) 272-3719. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2124

January 18, 2005

Kakali Cha.

**KAKALI CHAKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100**